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(71) Applicants
Albright & Wilson Limited, Albright & Wilson House, Hagley Road West, Oldbury, Warley, West Midlands
(72) Inventors
David Stainsby Golightly, John Patrick Minogue
(74) Agent
R. G. M. Savidge

(54) Improvements relating to talc dispersions

(57) Coating grade talc is dispersed in water, using an organic polyelectrolyte dispersant such as polyacrylic acid and an anionic or non-ionic wetting agent such as a dialkyl sulphosuccinate.

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SPECIFICATION

Improvements relating to dispersions

This invention relates to dispersant systems for talc to be used, for example, as a coating material in the paper industry. In making such dispersions, the objective is to disperse in a reasonably short-time, say 1 to 2 hours, as much talc as possible in a stable pumpable dispersion. The smaller the particle size of the talc, the more difficult is this objective to achieve.

A known dispersant system which is capable of forming a dispersion of 68.5%, based on the total dispersion, of talc having the majority of particles greater than 5.5μm (suitable for paper filling) has the following composition:

		Percent	
		on dispersion	on talc
As Dispersant:	Disodium salt of copolymer of maleic anhydride and di-isobutylene	.68	1
As Thickener:	Carboxymethylcellulose	.685	1
For pH Control:	1M NaOH solution	.78	1.13

However, for paper coating a talc is required having a majority of particles less than 2.5μm. Known dispersants do not permit the dispersion of more than about 60% by weight of such particles.

According to our invention, it is possible to obtain a satisfactory dispersion of coating grade talc, if there are included in the dispersant system the following constituents:—

(i) an organic polyelectrolyte dispersant

(ii) a nonionic or anionic wetting agent, said system providing a pH of 7 to 11 in the dispersion.

The dispersant may, for example, be an alkali metal salt of a poly carboxylic acid, e.g. a copolymer of maleic anhydride and di-isobutylene or preferably a homo- or copolymer of acrylic acids. Other dispersants include carboxymethyl cellulose and naphthalene sulphonate/formaldehyde condensates.

The dispersant preferably has a weight average molecular weight less than 100,000 and a number average molecular weight greater than 1,000 e.g. 1,000 to 10,000.

The wetting agent may be any of the known anionic or nonionic surface active agents, e.g. nonionic substances such as oxyethylated and/or oxypropylated fatty alcohols, fatty acids, alkylphenols or fatty amines, or anionic substances such as alkyl ether sulphates, olefin sulphonates, alkyl benzene sulphonates, alkyl phenol ether sulphates alkyl sulphates or amine ether sulphates. Particularly preferred are the di-alkyl sulphosuccinates.

Preferably the wetting agent has one or two alkyl groups having from 6 to 14 carbon atoms e.g. 8 to 10 carbon atoms. A typical example is di-octyl sulphosuccinate, with either straight chain or branched chain alkyl groups.

The composition may optionally contain inorganic dispersants such as sodium or potassium polyphosphates, silicates or hexametaphosphates.

It is desirable to avoid or reduce foaming, and according to preferred embodiments of our invention, this may be achieved in one of three ways:—

1. By selection of a wetting agent (e.g. a dialkyl sulphosuccinate) which has relatively low foaming character.
2. By inclusion of an antifoam such as a fatty alcohol or silicone antifoam.
3. By use of mixing techniques which do not involve a substantial liquid/gas interface.

According to one embodiment our invention provides a stable pumpable dispersion in water of at least 60% by weight of the dispersion of talc having a majority of particles less than 2.5μm said dispersion containing from 0.1% to 2% based on the weight of talc of an organic polyelectrolyte dispersant having a number average molecular weight greater than 1,000 and a weight average molecular weight less than 100,000 and from 0.1% to 2.5% based on the weight of talc of a nonionic or anionic wetting agent and having a pH between 7 and 11.

Preferably the dispersion contains at least 65% by weight of the talc, e.g. 65% to 75%. The preferred concentration of dispersant is 0.3 to 1% based on the weight of talc.

The preferred concentration of wetting agent is 0.5 to 2% based on the weight of talc. The preferred pH is 8 to 10.5.

The dispersant system of the invention may be manufactured as an aqueous concentrate containing 20 to 80% total of dispersant and wetting agent. The purchaser of this concentrate may add

a base to adjust the final pH and then water to the required dilution, before mixing with the talc.

The invention is illustrated by the following examples:—

EXAMPLE 1

The talc to be dispersed, known as Lohjatalc PV10 had the following specification:—

99.9% less than 20μm.

99% less than 10μm.

85% less than 5μm.

60% less than 2μm.

35% less than 1μm.

The dispersion had the following composition:—

Lohjatalc PV10: 65% (dry weight)

Empicryl APD (sodium salt of di-isobutylene — maleic anhydride copolymer, 25% solids); 0.49% (0.75% on talc).

Empilan KA10/80, a blend of C10—12 fatty alcohol 10 moles ethoxylate, 80%; water 20%; 0.81% (1.25% on talc).

Molar sodium hydroxide solution; 0.73% (1.13% on talc).

Water; balance to 100%.

The dispersion was prepared by dissolving all the water-soluble components of the formulation in the balance of water required, and then adding the talc to the solution with the aid of a high-speed mixer over a perlod of 45/50 minutes.

The viscosity of the dispersion was measured by a Brookfield Viscometer at ambient temperature immediately after processing, and after three days storage. The slurry tended to thicken and sediment on standing, but could be readily reconstituted by mild agitation.

Result	Time	Viscosity
	0 days	480 cps
	3 days	160 cps

EXAMPLE 2

A dispersion was prepared by the method given in example 1. The composition of the dispersion was as follows:—

Lohjatalc PV10; 65% (dry weight)

Dispex N40 (sodium Polyacrylate, 40% solids); 0.325% (0.5% on tacl)

Empimin OT (60% active di-octyl sulphosuccinate); 0.975% (1.5% on talc).

1 molar sodium hydroxide solution; 0.73% (1.13% on talc).

Water; balance to 100%.

The viscosity was measured as in example 1, with the following results:—

Result	Time	Viscosity
	0 days	1,200 cps
	3 days	800 cps

EXAMPLE 3

A dispersion was prepared by the method given in example 1. The composition of the dispersion was as follows:—

Lohjatalc PV10; 65% (dry weight)

Dispex N40% 0.2% (0.3% on talc)

Empimin KSN70 (sodium C_{12-18} alkyl 3 mole ether sulphate); 1.17% (1.8% on talc).

1 molar sodium hydroxide solution; 0.73% (1.13% on talc)

Water; balance to 100%.

The viscosity was measured as in example 1 with the following results:—

Result	Time	Viscosity
	0 days	2,300 cps
	3 days	800 cps

EXAMPLE 4

A dispersion was prepared by the method given in example 1 except that instead of Lohjatalc PV10 there was used a talc known as Finntalc C10, having the following specification:—

99% less than 12 μm.

75% less than 4 μm.

50% less than 2.3 μm.

25% less than 1.2 μm.

Sodium tripolyphosphate was used as a deflocculating agent.

The dispersion had the following composition:—

Finntalc C10; 65% (dry weight)

Empicryl APD; 0.49% (0.75% on talc)

Empilan KA10/80 0.81% (1.25% on talc)

Sodium tripolyphosphate; 0.065% (0.1% on talc)

1 molar sodium hydroxide solution; 0.73% (1.13% on talc)

Water; balance to 100%

Result	Time	Viscosity
	0 days	960 cps
	3 days	280 cps

EXAMPLE 5

A dispersion was prepared as in example 4 except that the Empicryl APD was replaced by an equal weight of Dispex N40.

Result	Time	Viscosity
	0 days	300 cps
	3 days	5,500 cps

EXAMPLE 6

A dispersion was prepared by the method given in example 1. The talc used in the dispersion was Finntalc C10.

Sodium silicate, sold under the trade name Pyramid Grade No.84 (Crosfields), was used as the optional ingredient.

The dispersion had the following composition:—

Finntalc C10; 65% (dry weight)

Empicryl APD; 0.49% (0.75% on talc)

Empilan KA10/80; 0.81 (1.25 on talc)

Sodium silicate; 0.33% (0.5% on talc)

1 molar sodium hydroxide solution; 0.73% (1.13% on talc)

Water; balance to 100%.

Result	Time	Viscosity
	0 days	440 cps
	3 days	400 cps

EXAMPLE 7

The following comparative experiments were performed using the dispersion system as set out in Page 1 of the application. That is for a 65% solids talc dispersion:

Polyelectrolyte dispersing agent: 0.65% (1% on talc)

Carboxymethyl cellulose; 0.65% (1% on talc)

1 molar sodium hydroxide sol'n; 0.73% (1.13% on talc)

This dispersing system was used to attempt to prepare 65% talc dispersions from both Finntalc C10 and Lohjatalc PV10 using Empicryl APD as the polyelectrolyte dispersing agent.

In both experiments it was not possible to disperse all the talc.

EXAMPLE 8

The experiment of example 7 was repeated using Lohjatalc PV10 with Dispex N40 as the polyelectrolyte dispersing agent. It was not possible to disperse all the talc.

CLAIMS

1. The method of dispersing talc for use in coating paper which comprises dispersing the talc in an aqueous solution containing an effective amount of an organic polyelectrolyte dispersant and a nonionic or anionic wetting agent and having a pH of from 7 to 11.

2. A method according to Claim 1 wherein the dispersant is a polycarboxylic acid.

3. A method according to Claim 2 wherein the dispersant is a copolymer of maleic anhydride and di-isobutylene.

4. A method according to Claim 2 wherein the polycarboxylic acid is a polyacrylic acid.

5. A method according to any foregoing claim wherein the dispersant has a weight average molecular weight less than 100,000.

6. A method according to any foregoing claim wherein the dispersant has a number average molecular weight greater than 1,000.

7. A method according to Claim 6 wherein the dispersant has a number average molecular weight of from 1,000 to 10,000.

8. A method according to any foregoing claim wherein the wetting agent is an oxy-ethylated and/or oxy-propylated fatty alcohol, fatty acid, alkyl phenol or fatty amine.

9. A method according to any of the Claims 1 to 7 wherein the wetting agent is an alkyl ether sulphate, olefin sulphonate, alkyl benzene sulphonate, alkyl phenol ether sulphate, alkyl sulphate or amine ther sulphate.

10. A method according to any of the Claims 1 to 7 wherein the wetting agent is a di-alkyl sulphosuccinate.

11. A method according to any foregoing claim wherein the wetting agent has one or two alkyl groups having from 6 to 14 carbon atoms.

12. A method according to Claim 11 wherein the wetting agent has one or two alkyl groups having from 8 to 10 carbon atoms.

13. A method according to Claim 12 wherein the wetting agent is di-octyl sulphosuccinate.

14. A method according to any foregoing claim wherein there is present in the dispersion an antifoam.

15. A method according to the Claim 14 wherein the antifoam is a fatty alcohol.

16. A method according to Claim 14 wherein the antifoam is a silicone.

17. A method according to any foregoing claim wherein the dispersion is prepared by mixing in the substantial absence of a liquid gas interface.

18. A stable pumpable dispersion in water of at least 60% by weight of the dispersion of talc having a majority of particles less than 2.5 millimicrons, said dispersion containing from 0.1% to 2% based on the weight of talc of an organic polyelectrolyte dispersant having a number average molecular weight greater than 1,000 and a weight average molecular weight less than 100,000, and from 0.1% to 2.5% based on the weight of talc of nonionic or anionic wetting agent and having a pH of between 7 and 11.

19. A composition according to Claim 18 containing from 65 to 75% by weight of talc.

20. A composition according to either Claims 18 and 19 containing from 0.3 to 1.0% of the dispersant based on the weight of talc.

21. A composition according to any of Claims 18 to 20 containing from 0.5 to 2% of wetting agent based on the weight of talc.

22. A composition according to any of Claims 18 to 21 having a pH from 8 to 10.5.

23. A composition according to any of Claims 18 to 22 wherein the dispersant is a polyacrylic acid.

24. A composition according to any of Claims 18 to 23 wherein the wetting agent is a dialkyl sulph: succinate.

25. A composition according to any of Claims 18 to 24 wherein the wetting agent has one or two alkyl groups having from 8 to 14 carbon atoms.

26. A dispersant composition for use in the dispersion of talc for coating paper consisting essentially of an aqueous solution containing from 20 to 80% total of an organic polyelectrolyte dispersant and an anionic or nonionic wetting agent.

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